

Glenn Research Center High Energy Rocket Engine Research Facility (B-1)

The High Energy Rocket Engine Research Facility (B-1), Building 3111, was designed in the early 1960s for static firing of hydrogen fluorine engines of up to 30,000 lb thrust under simulated altitude conditions. B-1 was never used for actual engine firing or for testing fluorine, but the addition of an exhaust duct cooling system allowed the facility to test engine systems in vacuum conditions.

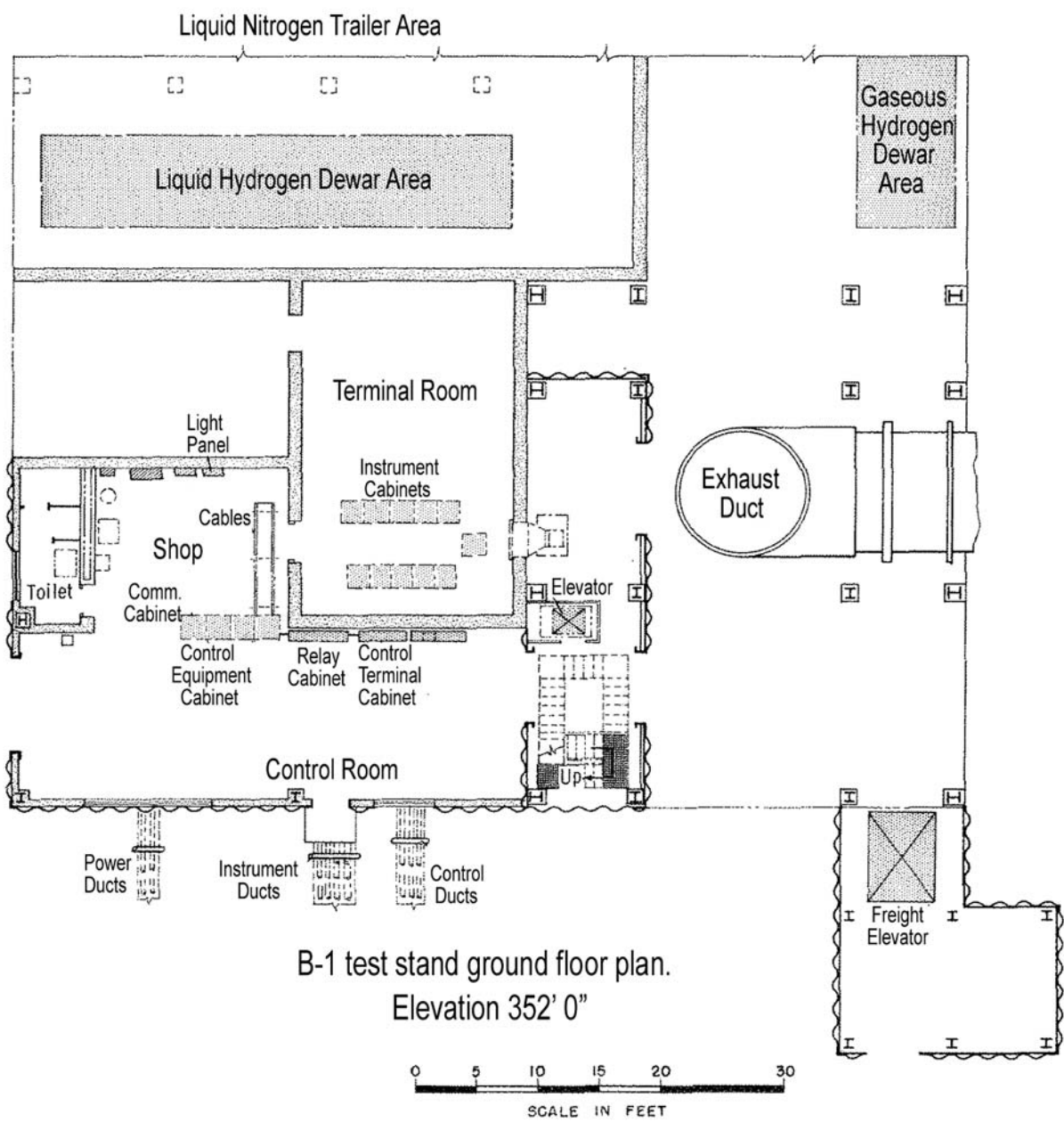
The B-1 test stand was 34- by 42-ft with a 135-ft-tall vertical tower. The test chamber was a 13-ft-diameter, 30-ft-long space located between the 68- and 176-ft levels within the tower. A 2000-gal liquid-hydrogen run tank was located at the 96-ft level. Rollup doors on three sides provided ventilation when hydrogen was in use. The rocket engine was operated in simulated space conditions to test the turbopumps, heat transfer, flow rate, and other properties without firing the engine. The rocket exhausted its propellant downward into a diffuser whose walls were surrounded by a water jacket.

The exhaust gases from the rocket passed through the diffuser into a water spray cooler that scrubbed the gas. The large exhaust duct descended to ground level underneath the tower, then made a 90° turn into a two-stage steam ejector system. Steam for the ejector system was generated in four 25,000 lb/hr boilers at the Boiler House. The steam was stored in several large accumulators.

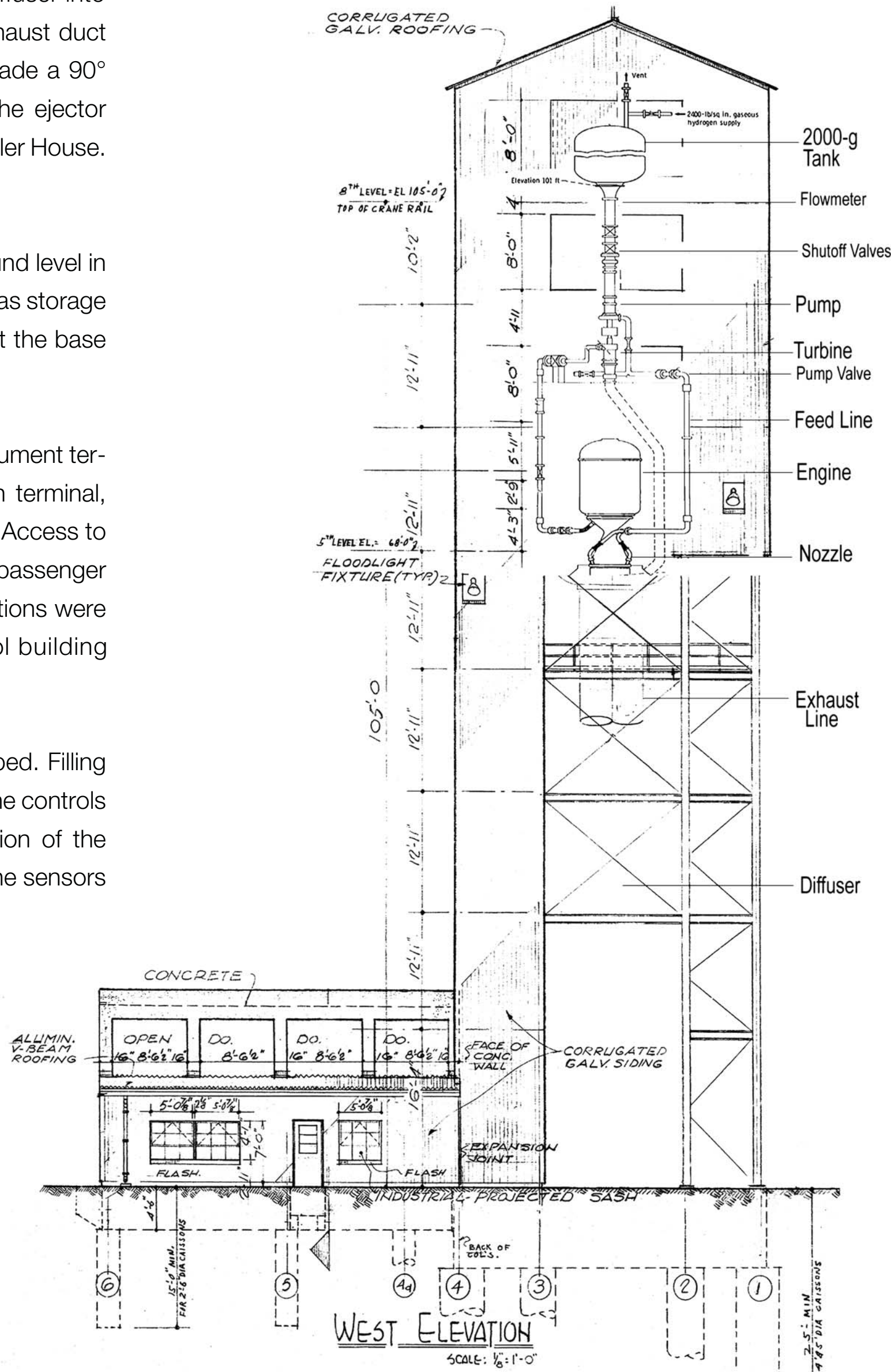
All gaseous and cryogenic supplies were stored at the ground level in compressed gas cylinders semitrailers, fixed compressed gas storage bottles, and liquid dewars mounted on trailers or railcars at the base of the test stand.

The enclosed area of the B-1 ground level included an instrument terminal room with instrument cabinets, a control room with terminal, relay, and equipment cabinets, a shop area, and restroom. Access to the tower was permitted by a stairwell, freight elevator, or passenger elevator. The area was vacated during tests. All test operations were conducted remotely from a reinforced concrete control building 2600 ft from the test structure.

Prior to a test, B-1 was instrumented, cleaned, and prepped. Filling the steam accumulators required 2 days. On the test day, the controls engineer ordered the test events and verified the operation of the valves and pumps. An instrumentation engineer checked the sensors and instrumentation. A data engineer made sure that the H Control and Data Building was receiving the test data, and an electrical technician monitored the data recorders and other electronics. The operating engineer actually ran the test for the researchers who were also present. Once all checks were complete, the steam ejector system was initiated. The operators would wait for the exhaust duct to eject 2 psi; then they would allow the test program timers to commence the test. The tests usually lasted under 1 minute. Afterward, any lingering hydrogen was removed and the facility was secured.



B-1 Floor Plan



B-1 West Elevation - Scale: 1/8" = 1'-0"